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(The Organ of the Mysore Agricultural and Experimental Union)

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The Mysore Agricultural Journal

(The Organ of the Mysore Agricultural and Experimental Union)

Vol. XXVI] July—December 1947 [No. 1 & 2

Rural Reconstruction and Agriculture

By K. H. Sreenivasan, M.A., B.Sc. (Edin.)

Director of Agriculture in Mysore

Various terms such as 'Rural Reconstruction', 'Rural Habilitation', and 'Village Upliftment' are used in connection with improving the existing condition in villages, the main idea being to grade up the living standard of the masses. Mysore, like India, is teeming with innumerable villages dotted all over the country amidst hills, dales, valleys and table land. We have in Mysore over 19,000 villages both big and small. The life in the villages as compared with the life in modern towns is anything but satisfactory. Modern amenities of life brought about by the impact of western ideas are slowly permeating the village and are in a way responsible to stir the hearts of the villagers. The miserable and pathetic life in the villages is a gloomy contrast to the life in a modern city with all its glamour for civic life.

If one were to visit a village one will be struck by the apathy and ignorance of the people, squalour and insanitary conditions. As one approaches a village the striking features observable are invariably common to almost all of our villages. The approach road is in disrepair and impassable during the monsoon season. These are dotted on either side with heaps of manure as a festoon to welcome the visitor. A little further on we come to the village itself. There we see the 'Glory' of the village life. The houses are built helter skelter without any layout. The drains are full of effluent and dirt—a breeding place for mosquitoes. Very often a lonely drinking water well is dilapidated and under disrepair. The village pond which is a source of water-supply in most places is also the place where both men and animals wash and bathe. The dwelling houses of the villagers are ill-ventilated and both men and beasts live in harmony in these.

In quite a number of villages there are no schools. There are rarely any dispensaries to administer medicines to the sick. Meanwhile litigation on pretty squabbles is making the poor raiyat still poorer by the villainous attitude of a greedy money-lender or a land-grabber. The money-lender is supreme and

wields an unusually considerable influence. The village panchayat which is supposed to work for the common good of the village is in most cases a defunct organisation, mainly because self-interest is playing a more vital part than the common interest for the benefit of all in the village.

The villager himself after his harvest is over, spends most of his time in idleness. There are no subsidiary industries to engage the attention and absorb the leisure hours of the agriculturists. The middle-man merchant or the trader is considered as their saviour for marketing their produce at their door step. The ideal of co-operation has not so far infiltrated into the economic life of most of our villages. Seeing that agriculture is the main occupation of our villages one is struck by the callousness with which the villager treats his land which is his mainstay. The land is allowed to be eroded by the forces of nature. The little available forest and tree-growth round about is cut down and destroyed. Cattle have no good pasture for grazing, which leads to their emaciation. Even the little dung that is available instead of going into the soil to raise rich harvests is burnt away to give a warm meal. Such in brief is the condition of most of our villages. How can we uplift the villages or reconstruct life in the villages when one is confronted with so many obstacles ?

This is by no means an easy task either for one individual or a group of individuals or for that matter for any agency of government. The Government of Mysore is trying its best through its various departments, placing enough funds at their disposal to implement their programme of work in the villages.

Rural reconstruction work was taken up by Mysore Government in 1936. A few villages in each taluk were selected for intensive work and each of the Government departments was moved to implement its programme of work. Somehow or other the work did not progress as anticipated and there was a set-back for the scheme and it was not pursued for some time. A comprehensive scheme of Rural Reconstruction was again launched in the year 1943 and a group of villages in each taluk was selected for intensive work. Again in 1945 a second group of villages was selected all over the State for a similar purpose.

This scheme has now developed into a Department of Rural Reconstruction under a State Officer. Each district has a Special Rural Development Officer and influential local people are employed as Hobli workers to co-ordinate the advice rendered by separate departments and implement them in the villages belonging to the selected Hoblies.

The Department of Agriculture through its District, Taluk and Hobli staff began to pursue its own programme of work. The following table will show the amount of work turned out by the Department.

Value of Articles Supplied

Districts	Total (1946-47)			Taken up by selected villages (1946—47)		
	(1) Seeds	(2) Manures	(3) Implements	(1)	(2)	(3)
Bangalore ..	30167	283305	122248	20044	10836	29454
Kolar ..	45966	210530	161354	1169	10903	9187
Tumkur ..	86922	136814	166284	36508	36632	48846
Mandya ..	58048	348768	152606	30277	105912	62345
Mysore ..	36264	128367	84460	26148	45939	21399
Hassan ..	14409	59231	91272	22006	14068	33078
Kadur ..	17232	69662	84910	5845	34436	3594
Shimoga ..	39937	70122	118023	24154	20341	53922
Chitaldrug ..	24519	156288	131769	17916	60998	36141
Total ..	353464	1463087	1112926	184071	340070	237909

The aim of the Agricultural Department is to improve the agricultural status of the villages by propaganda, exhortation, publishing pamphlets and by actual demonstration. The number of such demonstrations conducted in the villages of selected Hoblies as also for the whole State is furnished in the following table.

Demonstration and Other Plots

District	State			In selected villages
	Subvention Farms (1)	'A' Farms (2)	Demonstration Farms (3)	1, 2 and 3
Bangalore ..	7	77	500	382
Kolar ..	6	24	243	35
Tumkur ..	2	65	264	146
Mandya ..	..	37	..	118
Mysore ..	27	58	231	90
Hassan ..	15	45		169
Kadur ..	11	..	85	96
Shimoga ..	28	61	364	310
Chitaldrug ..	6	19	230	136
	102	386	2221	1482

The figures though satisfactory in themselves for having shown a progress do not yet bring the desired result. I am convinced that the raiyats having realised the benefits accruing from following improving agricultural systems are not following a progressive adaptation of such methods by themselves. If

these improvements have to be sought after year in and year out either through bounties of Government or by repeated pursuation of the Department concerned, I am afraid the achievements we hope for cannot be of a lasting or of a permanent nature. What is therefore needed is a will to benefit by lessons taught to them by the appropriate departments and the villages should learn the art of self-help and mutual assistance.

My experience has been that whenever the helping hand is withdrawn from the villages the *status quo* is returned to the old state of affairs. Therefore what is needed in rural reconstruction is that the villagers themselves should realise where their salvation lies. This does not mean that State help should be withdrawn. On the other hand, I feel that the State has a great responsibility in setting the villages on their legs.

In Mysore nine-tenth of our population live in villages. Though we have industrially progressed more than other provinces or states, yet, our main national resources are drawn from the villages. As education spreads deeper and deeper we have more cause to take up seriously the question of improving life in the villages. Ten years ago we had nearly 5,700 Primary Schools in the villages. Now in 1946 we have about 8,000 Primary Schools with the necessary number of higher educational institutions. The literacy at present in Mysore is 13% and with the expanded education programme of Mysore the per cent. of literacy in about 20 years may reach to more than 50%. Out of the 73 lakhs of population, nearly 56 lakhs live in our villages. When more than 50% are educated, can we hope to make an educated young man stick to a life as is obtaining at present in our villages unless conditions change for the better at least to a small measure, approximating to that of a small town?

I am afraid it would be impossible for an educated man to live in villages. In order to encourage the young people to settle on the land and lead their life in the villages and not to migrate to the cities and swell the ranks of the unemployed, rural reconstruction has to be remodelled and replanned. Even in agricultural methods a thorough change in approach is indicated. It is well nigh impossible to think that an educated young man can walk behind a wooden plough hitched to a slow moving pair of bullocks; nor could we expect him to attend to all the drudgeries and monotonies of manual labour, that are so much required at present on farm-steads.

A judicious use of mechanisation in agriculture to minimise manual labour may be an incentive for the young man to stick on to the traditional occupation of his forefathers. Perhaps at a later stage it may be even necessary to regroup our villages into small townships to provide amenities of civilised life, instead of the present cluster of houses ranging from a couple to a hundred or two.

In any case a thorough and sound planning is necessary. And I consider at the same time a thorough change in the local panchayats is necessary. The present panchayat system though well conceived is not operating for the benefit of the whole village. The influential man or the money-lender of the village being invariably one of the committee members does not lend himself to the harmonious working of the panchayat. There are a hundred and one things to be attended to in the village to make it a happy place to live in. Each one should contribute to the welfare of all and all to the good of the individual.

Unless the people come forward to help themselves no Government however wealthy it might be or well intentioned it may be, will be able to achieve the things it strives for.

The 'Red' villages in Soviet Russia have a plan given to them by the Government and a committee is constituted with members who are imbued with a zeal to work for the common good. India has attained her independence throwing away the foreign yoke and all over the country a change in Governments has taken place in conformity with the new ideals of attaining liberty, equality and fraternity. And every Government in provinces or States is now giving a more hopeful outlook for the common man and his lot. In Mysore I feel we should reconstitute the village panchayats to consist of members who can work for the common good and they should have sufficiently enlarged powers including to some extent judicial powers to minimise litigation. Such of the members who are not disposed to work for the common good have to be severely dealt with and they should be made to feel that they are responsible not only to the central government but also to their village polity.

The village officers of Mysore have been doing a laudable service in our rural parts and it is hoped they also will in future contribute in a greater measure for the well-being of our rural masses.

Land Use: A Plan

By N. G. Chokkanna, M.Sc., D.Phil.
Chemist, Coffee Research Station, Balehonnur

Agriculture in the tropics and particularly in India is a marginal and risky proposition. Success depends much upon the receipt of sufficient rainfall at the proper time except where artificial means of providing the necessary water by irrigation is found. The limiting conditions of tropical agriculture are mainly two, the first being soil moisture and the second, the organic matter present in the soil. To a great extent the first is closely related to the second as the waterholding capacity of a soil is dependent upon the colloid complex present in it. Depending largely upon these two factors hang precariously the life and fortunes of the millions of peoples living in the tropics. If these two are provided, then all other improvements in methods of agriculture will prove successful otherwise, they will all be largely failures. Therefore all other improvements must follow the adequate provision of these two—the mainstay of tropical agriculture.

In India the increase in population has been so great of recent years that the pressure of population on the soil is already beginning to be felt. On a generous computation the available arable land if divided between the agricultural classes will provide only five acres for a family of five, that is, an acre per head of agricultural population. This every body will agree is absolutely insufficient for the maintenance of life, let alone a decent standard of living. Added to this quite a large proportion of the live-stock—from which a very major portion of the organic matter for the soil is at present obtained—depends to a great extent upon the existing arable area. Living and producing on this small area of land, the limits to which the agriculturist can effect improvements, taking advantage of the modern methods of agriculture, are very small, however much he may wish to do so.

Another cause that is holding up progress in agriculture in India is the fragmentation of holdings consequent to the system of division of property whereby every one of the offsprings has a share in the paternal property. The property of many a ryot can be found scattered about in bits of less than a quarter of an acre all over the area. How can the ryot pay proper attention to all the lands when they are so distributed? The land nearest to his dwelling place gets the greater part of his attention and that far away is neglected and he scrapes what little he can out of the soil. The result is that these lands although originally quite fertile become soon marginal and produce very uncertain crops.

Another cause of neglect and reduction in fertility of the land is the existence of a class of landlords who do not work on it and who do not depend on it for their maintenance. The lands they hold are only an investment of an otherwise idle capital.

They are quite chary about causing any improvements to their lands as they feel—to a large extent this is true—that they do not get an adequate return to the capital they invest as the ryot is likely to cheat them of their increased produce. There is also the chance that the manure, seed and capital intended for the land-lord's field and handed over to the ryot may not be utilized for that land but may be used for the ryot's own land. The ryot is not interested in bestowing full attention on a land which is not his own and tries to get as much as possible out of it with the least expenditure of capital and labour. The result is neglect.

Capital required to consolidate the fragmented holdings is not easily forthcoming and if at all available it is only at usurious rates of interest. Land Mortgage Banks have been functioning in some localities and the result of their activities cannot be termed successful.

Legislators have been thinking of ways and means of surmounting the evils of these systems and in co-operation with the Agricultural Departments have tried to effect improvements. All these efforts have not proved of much avail as the neglect has gone on too long and too far to be remedied by piecemeal measures. In desperation people have begun to think of nationalization of land. Recent trends in legislation to effect improvements have taken the turn towards nationalization of all land and ending once for all the absentee land-lord class and converting the peasant proprietor into a tenant of the State. This probably in the ultimate analysis is the best solution but does not take into account the very nature of the people in whose cause it seeks to effect legislation. The Indian, big or small, is at heart a capitalist and investment on land has always been considered the safest form of investment of capital although the returns are usually small indeed. The communistic way of life is quite opposed to all traditions of India and the very constitution of Indian Society. The Joint Family system although it appears to be communistic in practice, is really patriarchal in nature and is based on that very selfish, extremely capitalistic and, insular unit—"The Family". The ryot has not yet fully accepted even the principle of co-operation. He is shrewed enough to follow it to a limited extent and seeks the benefits of co-operation only in so far as it can benefit him personally and help accumulation of wealth in his own hands. He is not yet educated to sacrifice it for the common good.

In nationalizing the land the State seeks to destroy all the traditions of thousands of years and attempts at becoming the sole proprietor of all land. In this way it tries to dispossess all and create an agrarian labour class. It attempts to put up a show of allowing proprietorship by leasing out land on long tenures. However, it must be mentioned here that all proposals to nationalize land have one good feature in that they recommend adequate compensation to those whom the State seeks to dispossess. This

will involve heavy capital expenditure even if this is done by the issue of National Bonds in lieu of money. To pay interest on such bonds the State will have to take recourse to increased taxation. If nationalization is attempted at one stroke—otherwise it will again be a case of tinkering—it will prove a financial disaster as inflation would follow and in its wake come all accompanying evils. The other alternative is to deny all obligations to compensate and convert the country into a communistic State. Is there any necessity to do so and arouse conflict? Are there no other means of achieving the same object without recourse to such drastic measures? Is it not possible to educate the ryot and accustom him gradually to the time when he will welcome a communistic way of life? Cannot an organic and continuous evolution take place resulting in a growth having its roots in the long traditions of the past and thriving in the present, prepare for a future of glorious mien.

The answer to the above is the starting of private limited liability concerns. All landowners in a village will become members of this Company and will be allotted shares in proportion to the value of the land, implements and live-stock they possess and are willing to surrender. No extra outlay in capital will be needed for consolidation of the holdings except the small amount needed to register the Company and issue the shares. All the land in the village passes into the hands of a single proprietor—the Company. The advantages arising out of the formation of such a Company are:—

(*a*) The village and the absentee landlord continue to retain an interest in the land and may contribute towards its improvements. The ryot can continue to work on the land and in addition to the profit he could gain as a shareholder, would earn wages in proportion to the work turned out by him.

(*b*) Assured income to every one in the village as the produce is treated as whole and the profits are divided on a share basis. Employment is available for every one willing to work. Even if the crops fail in any particular season or part of the land the profits from other parts and dividend equalization funds will make up for the deficiency and assure a dividend to every one.

(*c*) The land will have a centralized management and a better planned use. Each type of land will get all the attention it needs and deserves and only such crops as will prove economic will be grown on it. No land will suffer for want of labour at any time as all the available labour force is at the disposal of the Company and can be employed whenever needed. Better utilization of water resources will automatically follow unlike as at present when waste is the rule rather than the exception under tank irrigation.

(*d*) The villager being an employee of the Company earns a regular wage in addition to his own share of profits. He is

saved from the eternal worry of meeting financial commitments which are a feature of the ryotwari system. As the Company can earn higher profits as it can effect improvements in the methods of agriculture and also bargain advantageously in marketing the crop it can pay a higher basic wage than at present and thus will help to raise the standard of living.

(*e*) The Company, on account of its large assets, can attract the needed capital at low rates of interest to effect permanent improvements to the land. Production of green manure crops and timely ploughing, etc., which are very difficult now as the work or crop on any one field has to depend on that of its neighbouring field or the owner will have to undertake elaborate precautions by way of fencing, etc., the Company being the sole proprietor can efficiently carry out these programmes.

(*f*) Soil conservation which is one of the crying need of the country can be tackled only by a large organization like the Company.

(*g*) The marketing of the produce becomes more efficient and satisfactory. The Company can cheaply clean, grade, and market in the most favourable market and thus earn a handsome profit.

(*h*) When all the land in the country thus becomes the property of different companies it becomes easier for the state to plan its agriculture. The state can enforce different tracts to grow the required quantity of particular crop and arrange the internal economy of the country.

(*i*) Collection of revenue whether it be land revenue or agricultural income becomes very easy as the books of the Companies are open for audit and evasion of incometax, etc., will be reduced.

(*j*) Propaganda to maintain better roads, health and growing profitable crops becomes easier to carry out and will come within the sphere of practical realization.

This type of consolidation is nothing very new as it has already taken place in specialized and organized industries like Transport, Coffee, Tea, etc. It requires only the patronage and the persuasion of the State to succeed. The inequitious land revenue system can easily be abolished and a tax on agricultural income without the cumbrousness of the old ryotwari system and maintenance of land records introduced. Provincial Surveys can be brought into operation. It might be urged that this could be achieved under the ordinary system of co-operative farming. The great drawback in it is that any one dissentient can ruin a society. In a limited liability Company the dissenter will have to sell out to the other share holders and get out. It assures co-operation and eliminates all chances of failure. To a large extent agriculture will escape the deleterious effects of adverse seasons and fluctuations in the value of farm produce. Its prosperity will come to lie on bed-rock.

A Picture of Our Manurial Problem

By M. Vasudeva Murthy, B.Ag.

Secretory, The Mysore Agricultural and Experimental Union

For some time it has been our problem to reduce our manurial requirement to simple terms and equate it with our local resources in Mysore. The main attention has been focussed on the paddy crop, leaving surplus to meet the demands of sugarcane and other commercial crops. In the scheme of fertilising the land for better production of crops four kinds of supplies come under review: (1) Green leaves, (2) Compost, (3) Oil-cakes, and (4) Artificials, like ammonium sulphate and superphosphate.

Singling out paddy the manurial requirement of this crop is of the order of 2 cwts. of groundnut oil-cake, or 1 cwt. of oil-cake and 56 lbs. of ammonium sulphate, or 1 cwt. of ammonium sulphate and 56 lbs. (*i.e.*, ½ cwt.) of superphosphate to an acre. The total acreage under paddy in the whole State is given as 8,27,180 acres in 1943-44. Against this the area under groundnut is 2,19,851 acres. These figures indicate that if 5 acres of groundnuts are taken to yield one ton of oil-cake, the groundnut acreage would, taken in all, supply the total paddy area at just 1 cwt. of cake to the acre; 8,27,180 acres of paddy would require 41,359 tons of cake, to produce which, an extent of 2,06,795 acres would be necessary. This would give us an indication that on the basis of local self-sufficiency the manurial formula which provides for 1 cwt. of cake might be taken as the standard. Thus for each acre of paddy we would have 1 cwt. of groundnut oil-cake, 56 lbs. of ammonium sulphate, 56 lbs. of superphosphate and provision of 20 seers of sannhemp seed to be sown for green manuring. On this basis the following stocks need to be assigned to each taluk in the State according to the area of paddy in the different taluks.

Taluks	Groundnut Oil-cake in Tons	Ammonium Sulphate in Tons	Super-phosphate in Tons	Sannhemp in Pallas
Bangalore North ..	138	69	69	550
Bangalore South ..	246	123	123	985
Hoskote ..	326	163	163	1308
Doddballapur ..	330	165	165	1320
Nelamangala ..	306	153	153	1230
Kankanhalli ..	188	94	94	750
Magadi ..	308	154	154	1230
Channapatna ..	276	138	138	1100
Anekal ..	342	171	171	1370
Devanahalli ..	184	92	92	737
Closepet ..	50	25	25	204
Kolar ..	590	295	295	2354
Bowringpet ..	480	240	240	1920
Chintamani ..	490	245	246	1962
Srinivasapur ..	598	299	299	2387
Mulbagal ..	540	270	270	2663
Sidlaghatta ..	128	64	64	510
Chikkaballapur ..	144	72	72	578
Bagepalli ..	148	74	74	594
Goribidnur ..	302	151	161	1210
Malur ..	334	167	167	1333
Gudibanda ..	136	68	68	542
Tumkur ..	820	410	410	3280
Madhugiri ..	398	198	199	1590
Chikkanayakanahalli	118	59	59	468
Sira ..	376	188	188	1500
Gubbi ..	350	175	175	1400
Tiptur ..	140	70	70	565
Pavagada ..	162	81	81	620
Kunigal ..	606	303	303	2420
Koratagere ..	62	31	31	244
Tnruvekere ..	86	43	43	341
Mysore ..	208	104	104	828
Krishnarajanagar ..	1480	740	740	5917
Chamarajanagar ..	468	234	234	1874
Heggadadevanakote ..	286	143	143	1147
Hunsur ..	372	186	186	1285
Gundlupet ..	70	35	35	260
Periyapatna ..	50	25	26	203
T. Narsipur ..	900	450	450	3600
Nanjangud ..	756	378	378	3022
Mandya ..	864	432	432	3455
Seringapatam ..	1082	541	541	4326
Malavalli ..	500	250	250	2000
Krishnarajapet ..	692	346	346	2772
Nagamangala ..	410	205	205	1643
Maddur ..	750	375	375	3000
French-Rocks ..	280	140	140	1320
Hassan ..	854	427	427	3414
Manjarabad ..	1410	705	705	5640
Arakalgud ..	472	236	236	1890
Belur ..	1002	501	501	4008
Channarayapatna ..	250	125	125	997
Arsikere ..	90	45	45	356
Holenarsipur ..	230	115	115	920
Alur ..	738	369	369	2947

Taluks	Groundnut Oil-cake in Tons	Ammonium Sulphate in Tons	Super-phosphate in Tons	Sannhemp in Pallas
Shimoga ..	1392	696	696	5588
Chennagiri ..	364	173	173	1380
Honnali ..	178	89	89	712
Shikaripur ..	1830	915	915	7320
Sorab ..	2244	1122	1122	8924
Sagar ..	1868	934	934	7473
Nagar ..	1410	705	705	5640
Thirthahalli ..	1534	767	767	6135
Kumsi ..	610	305	305	2436
Chikmagalur ..	1378	689	689	5507
Kadur ..	260	130	130	1041
Tarikere ..	442	221	221	1766
Koppa ..	850	425	425	3404
Mudigere ..	1124	562	562	4497
Narasimharajapur ..	632	316	316	2525
Chitaldrug ..	108	54	54	430
Challakere ..	242	121	121	970
Hiriyur ..	274	136	137	1072
Holalkere ..	142	71	71	570
Davangere ..	200	100	100	800
Molakalmuru ..	130	65	65	520
Jagalur ..	38	19	19	150
Hosadurga ..	146	73	73	580
Harihar ..	34	17	17	135

The area under groundnuts in each taluk suggests the extent to which the locality has the possibility of meeting its own demands irrespect of this oil-cake; the following figures indicate the surplus or deficit aspects of the Taluks.

Taluks	Area of Groundnut required to supply the Oilcake demand	Actual area under groundnut	Deficit acres	Surplus acres
Bangalore North ..	690	240	450	..
Bangalore South ..	1230	750	480	..
Hoskote ..	1630	420	1210	..
Doddaballapur ..	1650	1772	..	122
Nelamangala ..	1520	1310	220	..
Kankanhalli ..	940	580	360	..
Magadi ..	1540	335	1205	..
Channapatna ..	1380	700	680	..
Anekal ..	1710	560	1150	..
Devanahalli ..	920	320	600	..
Closepet ..	250	782	532	..
Kolar ..	2950	1499	1451	..
Bowringpet ..	2400	3000	..	600
Chintamani ..	2450	7324	..	4874
Srinivasapur ..	2990	1950	1040	..
Mulbagal ..	2700	2020	..	320
Sidlaghatta ..	640	992	..	352
Chikkaballapur ..	720	2500	..	1780
Bagepalli ..	740	8400	..	7660
Goribidnur ..	1510	4110	..	2600
Malur ..	1770	814	956	..
Gudibanda ..	680	1946	1266	..
Tumkur ..	4100	1060	3040	..
Madhugiri ..	1990	10215	..	8225
Chiknayakanahalli ..	590	255	335	..
Sira ..	1880	2500	..	620
Gubbi ..	1750	2394	..	644
Tiptur ..	700	2300	..	1600
Pavagada ..	810	10738	..	9928
Kunigal ..	3030	1876	1154	..
Koratagere ..	310	3562	..	3252
Turuvekere ..	430	520	..	90
Mysore ..	1040	508	532	..
Krishnarajanagar ..	7400	652	6848	..
Chamarajanagar ..	2340	4356	..	2016
Heggadadevankote ..	1430	100	1330	..
Gundlupet ..	350	4600	..	4250
Hunsur ..	1860	35	..	1825
Periyapatna ..	250	..	250	..
T. Narsipur ..	4500	1100	3400	..
Nanjangud ..	3780	3549	..	231
Mandya ..	4320	1735	3585	..
Seringapatam ..	5410	486	4924	..
Malavalli ..	2500	3620	..	1120
Krishnarajpet ..	3460	184	3276	..
Nagamangala ..	2050	..	2050	..
Maddur ..	3750	3702	..	48
French-Rocks ..	1400	65	1335	..
Hassan ..	4370	925	3475	..
Manjarabad ..	7050	..	7050	..
Arakalgud ..	2360	100	2260	..
Belur ..	5010	27	4983	..
Channarayapatna ..	1250	727	523	..
Arsikere ..	450	2368	..	1918
Hole-Narsipur ..	1150	65	1085	..
Alur ..	3690	..	3690	..

Taluks	Area of Groundnut required to supply the Oilcake demand	Actual area under gronndnut	Deficit acres	Surplus acres
Shimoga ..	6960	420	6540	..
Channagiri ..	1730	5050	..	3320
Honnali ..	890	12050	..	4060
Shikaripur ..	9350	55	9225	..
Sorab ..	11220	10	11210	..
Sagar ..	9340	..	9340	..
Nagar ..	7050	..	7050	..
Thirthahalli ..	7670	..	7670	..
Kumsi ..	3050	..	3050	..
Chikmagalur ..	6890	55	6835	..
Kadur ..	1300	1416	..	116
Tarikere ..	2210	1450	760	..
Koppa ..	4250	..	4250	..
Mudigere ..	5620	..	5620	..
Narasimharajapur ..	3160	..	3160	..
Chitaldrug ..	540	9950	..	9410
Challakere ..	1210	4410	..	3200
Hiriyur ..	1370	1844	..	474
Holalkere ..	710	7250	..	6540
Davangere ..	1000	42519	..	41519
Molakalmuru ..	650	4125	..	3475
Jagalur ..	190	13000	..	12810
Hosadurga ..	730	1000	..	270
Harihar ..	170	8086	..	7916

There are several problems connected with the oil-cake under consideration. First there is the arrangement to be made to supply the needs of the deficiency Taluks from the surplus areas. Secondly, the efforts at producing groundnut should be doubled if ammonium sulphate is to be entirely displaced by the oil-cake in the manurial formula. Then there is the demand for the oil-cake as cattle feed. Fourthly, groundnuts will have to play a part in human feeding as well. This points to the desirability of increasing the cultivation of this crop in all the areas. In this respect the case for both the crops, sannhemp as well as groundnut, is similar, for, to meet all the demand that is indicated, each locality has to produce and stock its own sannhemp and other green manure seeds.

In the above consideration the groundnut oil-cake has been practically monopolised by the area under paddy. No quantity is left over for other crops, which also deserve great attention. That is a case for taking into account all the oil-cakes that can be possibly utilised. One other important oil-cake that is used for manurial purposes is the castor oil-cake and one of the important crops that demands a large quantity of manure is sugarcane. On the basis of $\frac{1}{2}$ a ton of oil-cake for each acre, and the possibility of obtaining 1 ton of castor cake from 10 acres of that crop the following figures indicate the present position.

Taluk	Required area under castor crop to supply the demand of cane crop	Present area under castor	Deficit acres	Surplus acres
Bangalore North ..	865	102	763	..
Bangalore South ..	3025	350	2675	..
Hoskote ..	1000	150	850	..
Doddballapur ..	4015	303	3712	..
Nelamangala ..	2250	838	1412	..
Kankanhalli ..	1925	3101	..	1176
Magadi ..	2690	854	1836	..
Channapatna ..	2800	350	2450	..
Anekal ..	1400	100	1300	..
Devanahalli ..	1340	..	1340	.
Closepet ..	1355	2770	..	1415
Kolar ..	2080	61	2019	..
Bowringpet ..	2340	258	2082	..
Chintamani ..	1060	141	912	..
Srinivaspur ..	2675	47	2628	..
Mulbagal ..	3150	30	3120	..
Sidlaghatta ..	2260	12	2248	..
Chikballapur ..	2875	50	2825	..
Bagepalli ..	4100	820	3380	..
Goribidnur ..	9265	853	8412	..
Malur ..	2330	91	2239	..
Gudibanda ..	1525	191	1334	..
Tumkur ..	1000	2672	..	1672
Madhugiri ..	1245	2504	..	1259
Chiknayakanhalli ..	225	3264	..	3039
Sira ..	75	1950	..	1875
Gubbi ..	1115	4010	..	2895
Pavagada ..	10	920	..	910
Tiptur ..	425	3185	..	3760
Kunigal ..	5700	1104	4596	..
Koratagere ..	370	900	..	500
Turuvekere ..	755	2100	..	1345
Mysore ..	..	753	..	753
Krishnarajanagar ..	240	2890	..	2650
Chamarajanagar ..	1480	1246	234	..
Heggadadevankote	..	1145	..	1145
Gundlupet ..	60	6900	..	6840
Hunsur ..	..	1050	..	1050
Periapatna ..	..	593	..	593
T. Narsipur ..	7500	550	..	6950
Nanjangud ..	..	2936	..	2936
Mandya ..	26375	802	25573	..
Seringapatam ..	3780	765	3015	..
Malavalli ..	475	782	..	307
Krishnarajpet ..	4250	1755	2495	..
Nagamangala ..	1125	330	895	..
Maddur ..	12125	245	11180	..
French-Rocks ..	4010	215	3695	..
Hassan ..	9250	575	8675	..
Manjarabad ..	..	..	..	..
Arakalgud ..	350	195	155	..
Belur ..	4975	340	4635	..
Channarayapatna ..	3845	1427	2418	..
Arasikere ..	265	6161	..	5896
Hole-Narsipur ..	1750	350	1400	..
Alur ..	425	18	407	..

Taluk	Required area under castor crop to supply the demand of cane crop	Present area under castor	Deficit acres	Surplus acres
Shimoga ..	6600	145	6455	..
Channagiri ..	3750	490	3260	..
Honnali ..	1150	510	640	..
Shikaripur ..	6670	235	6435	..
Sorab ..	5045	420	4625	..
Sagar ..	3900	..	3900	..
Nagar ..	2150	..	2150	..
Thirthahalli ..	2175	..	2175	..
Kumsi ..	2680	..	2680	..
Chikmagalur ..	3450	415	3035	..
Kadur ..	3650	4700	..	1150
Tarikere ..	1050	752	298	..
Koppa ..	1550	..	1550	..
Mudigere ..	640	..	640	..
Narasimharajpur ..	300	..	300	..
Chitaldrug ..	875	1350	..	475
Challakere ..	..	15000	..	15000
Hiriyur ..	..	1395	—	1395
Holalkere ..	750	768	..	18
Davangere ..	3015	420	2695	..
Molakalmuru ..	..	2540	..	2540
Jagalur ..	85	3642	..	3557
Hosadurga ..	..	2325	..	2325
Harihar ..	30	160	..	130

The total area under sugarcane in the whole State for 1943–44 is 40,490 acres, which would make out a case for an area of 2,20,450 acres of the oil-seed crop to produce the cake required. The total area under castor is 1,01,471 acres. Here again this answers for just half the demand as taken above.

The above study concentrates attention on two consuming crops, paddy and sugarcane, and two cake-yielding crops groundnut and castor, and indicates how along with arranging distribution from surplus to deficit areas an effort to double the oil-seed crops noted above would go a long way in solving our manurial problem.

Field Control of the Leaf Mite of Jola (*Andropogon Sorghum*)

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Introduction

Of the several insects which damage the different parts of Jola, an important cereal crop of the State, the leaf-blade mite—*Paratetranychus indicus* H., has been observed since 1946, to be causing somewhat serious damage to the crop in the State. It has been recorded to be a major pest on Sugarcane in North India, and in South India, it is known to feed upon Jola, and some grasses. Though it is observed to occur on Sugarcane also in Mysore, it has not so far been known to cause as much damage to it as to Jola.

Nature and Symptoms of Damage

During 1946-47, the leaf-blades of Jola over large areas in Mysore, Mandya, Tumkur and Chitaldrug districts had turned blood-red; this affection has been popularly known by various names, such as 'Kumkum roga', 'Chandramaru', 'Rakthamaru', 'Samberoga', etc. On examination of the leaf-blades the presence of a large number of mites with eggs and larval stages could be made out, on the ventral surface mostly, though a few could be seen on the dorsal surface as well. Random counts revealed that the percentage of incidence was appreciably high, and the reddening of the leaves was no doubt, due to the work of the mites. Colonies of this mite—young and adult—feed gregariously on the sap of the leaves. Reddish patches appear here and there and with the increase in severity of attack the entire leaf turns red, with only the midrib remaining green. The affected Jola crop, because of the red colour of the blades, can be made out even from a distance. The leaves gradually dry up. The infection and damage start in small patches either on young or old plants and spread gradually from field to field. The female mites crawl from blade to blade of different plants when they are close together; they are also carried over long distances by wind. In cases of virulent attack, the entire stalk of the plant become dry and pithy, and the development of the earhead and the grains also are arrested; where the pest starts after the formation of earheads, the formation of grains is not much interfered with in spite of the severity of infection as was the case in Mysore District in 1946.

Brief Description of the Mite

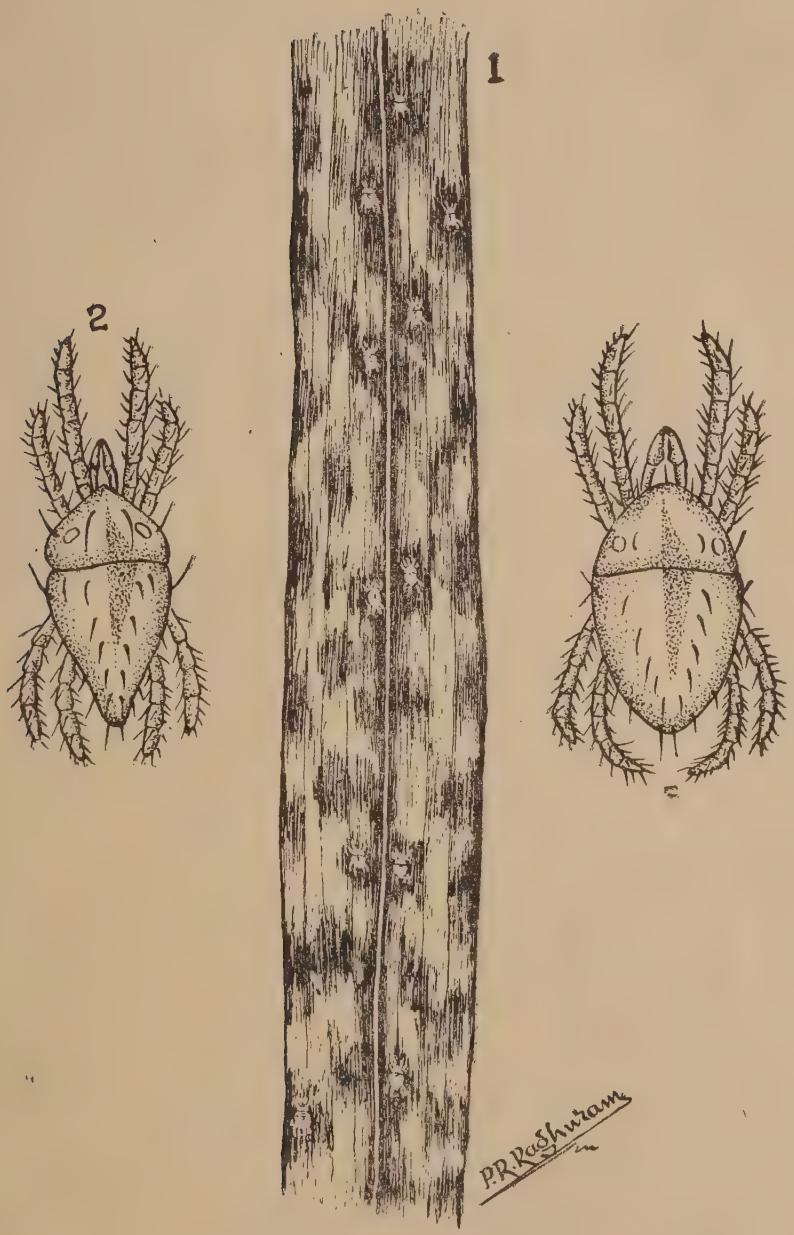
Paratetranychus indicus H. is a small organism closely related to insects. It has eight legs and is greyish-green or ambour coloured. The male is smaller than the female; the hind end of the female is more rounded, while in the male it is sharp and narrow. Dirty white spherical eggs are laid on the blades of Jola; they hatch into minute spherical, ambour coloured larvæ which have three pairs of legs. They soon attain the adult condition when they develop four pairs of legs. They live in colonies on the lower surface of the blades under a delicate protective web. All stages of their development, eggs, nymphs and adults can be commonly seen mostly on the lower surface of the blades.

Control Measures

Sulphur dusting.—Experiments conducted both in the laboratory and field with several chemicals in different combinations, showed that finely powdered sulphur either pure or mixed with wood ashes in the proportion of 1 : 4 was very effective against the mites. No living mite could be seen in any of the dusted blades, after 48 hours. The other chemicals tested, namely, tobacco powder, soap powder, pure and in combinations; DDT 1%; and gammexane (666 crude) 1%, were not quite satisfactory. Hence for large-scale field control of the mite, dusting of finely-powdered sulphur with wood ashes (1 : 4) was advised to the ryots in Mysore and Chitaldrug districts. Adequate quantities of sulphur were made available to the ryots at the agricultural depots, and demonstrations of dusting were held in several places for the benefit of the ryots. In addition to dusting—badly affected, old, and dried-up blades have to be removed, collected together and burnt. A close watch must be kept on the young crop and the moment reddish patches are seen on the blades, the latter must be immediately dusted with finely powdered sulphur mixed with wood ashes (1 : 4) to cover both the sides. In the absence of powerful hand dusters, pieces of fine muslin cloth may be used for dusting the sulphur. Timely sulphur dusting in the early stages of the attack will prevent the further spread of the pest.

Predator Beetles

Two kinds of predator beetles were found to be actively feeding on the mites. Both of them were Coccinellid beetles, and were found to be effective natural check on the mites. One is a tiny black oval-shaped beetle—*Stethorus pauperculus* W. and is the more predominant. Both the larva and the adult were found to feed upon the mite, the grub actively chasing and darting at its prey to clutch it by its mandibles. The larva is transparent and full of warts and hairs. It pupates on the leaf attaching itself by its caudal end. The adult beetle is black and finely pubescent,



Jola Mite—*Paratetranychus indicus*

1. Mites on Jola blade. 2. Male. 3. Female.

head being tucked under, so that only the thoracic portion on the body is made out.

The other beetle is slightly bigger and brownish with a dark shade on the elytra, and finely pubescent. It has been identified to be *Scymnus nubilus* M. Both the beetles and their grubs are effective predators on the mites. The beetles were identified by the authorities of the Imperial Institute of Entomology, British Museum, London.

I am grateful to Mr. B. Krishnamurti, Government Entomologist, for his kind suggestion and general guidance.

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Some Observations on the Biology and Habits of the Redgram (*Cajanus indicus*) Flower Bud Borer (*Euproctis scintillans* W.)

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Introduction

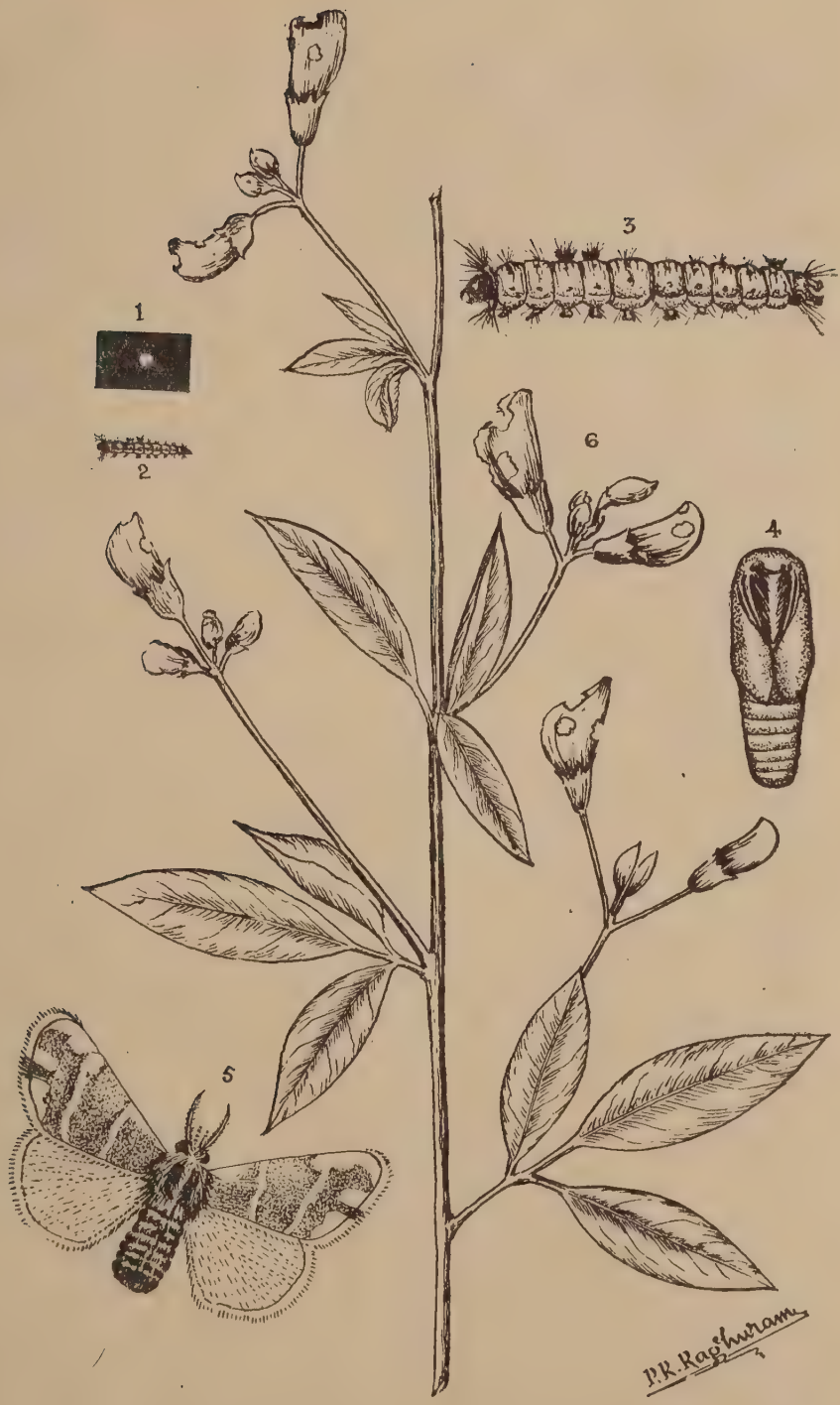
Redgram crop among the pulses, is subject to the attack of a number of major and minor pests, the latter, during certain years assuming the status of a serious pest. *Euproctis scintillans* W., usually a minor pest of Redgram, is a moth belonging to the group of tussock moths of the family Limantridæ. It has also been observed to be a pest of minor importance on Mango, Hibiscus, Sannhemp, Linseed, Castor and Redgram. During November-December 1946, the incidence of this pest was found to be serious on Redgram at Irwin Canal Farm near Mandya, unlike the other leaf-eating caterpillars of this group, this was found to bore in and feed upon mostly buds and flowers of Redgram. A study of the biology of this insect on Redgram crop has revealed certain marked peculiarities.

Biology—Life-history

Egg.—The female moth lays eggs on the leaves, generally on the ventral surface, in small batches, covered with yellowish-brown hairs derived from the anal tufts of the abdomen. The egg-masses are irregular in shape and the number varies from 8–10. In enclosures, egg-masses are laid even on the sides of the breeding cage, on old pods and leaves. The eggs are folded within the hairs and can be easily separated, the hairs being stuck to a small area by a gummy substance. Each egg is small, spherical, golden-yellow in colour, smooth allover, flattened on the upper and lower surfaces, the diameter of the egg being about 0·75 mm. When the abdomen of a gravid female moth was cut open long beaded oviducts with a maximum number of nearly 300 eggs in various stages of development, could be made out.

After the eggs are deposited, they turn darker on the fifth day, and caterpillars were found to hatch on the next day, the incubation period of the egg being about six days.

The first instar larva.—The newly hatched first instar caterpillar is 2·0 mm. long and 0·5 mm. thick, with blackish-brown head, body yellowish-white being covered with white long hairs. The abdominal segments from 1–8 possess each a pair of dark wart-like tubercles with short black hairs on them. The usual number of thoracic legs—3 pairs, and 5 pairs of prolegs of which



1. Egg
2. Young Caterpillar
3. Grown-up Caterpillar
4. Pupa
5. Moth
6. Damaged Flowers

one pair is on the last abdominal segment—characteristic of the Lepidopterous larvæ, are present. The caterpillar is very active and briskly crawls about the flower bud which is more preferred than the leaf. It spins long threads and hangs down and is easily blown off by wind to adjacent branches or plants. As it grows it becomes more and more yellowish, active and elongated. Before moulting it is still yellowish the head dark, and the tubercles appear brownish. The characteristic yellow band and the other tubercles begin to appear. By the dark appearance of the head and the tubercles on the body, the caterpillar shows signs of moulting. At this stage, it is inactive and stationary in one place.

The second instar larva.—The first moult takes place after 3–4 days, depending upon the growth of the caterpillar. Moulting is entire, the whole skin is left behind on the leaves, buds, etc.; splitting of the skin is seen on the thorax dorsally and the larva extricates itself. The size of the caterpillar is increased—length being 3·0 mm. to 5·0 mm., and thickness 0·75 mm. to 1·0 mm. The caterpillar is yellowish, but gradually becomes darker, velvety and hairy. The head is brownish and mouth-parts are well developed. The thorax is yellowish with two reddish-yellow or amber coloured, raised tubercles one on either side of the first thoracic segment. Hairs are prominent on the tubercles and warts, on the body, particularly on the sides. The abdomen becomes dark velvety with a central yellow longitudinal band in the third to seventh abdominal segments. There is a faint reddish streak in the middle of the yellow band extending on the thorax also. The tubercles are prominent on the first, second and eighth abdominal segments. They are dark, velvety, with hairs on them. The end of the body is reddish-yellow with hairs.

Along the sides of the entire body, are yellowish tubercles with hairs. The two abdominal tubercles on the first and second abdominal segments appear like one big raised hump. On the centre of the yellow band on the 6th and 7th abdominal segments, are two white glistening spherical globules showing depressions in the centre. The thoracic tubercles are yellowish-white and hairs are present on them. The hairs are grey and not dark allover. No difference can be seen on the ventral surface of the caterpillar which is uniformly yellowish.

The prolegs show the terminal suckers with chrochets and the thoracic legs end each in a single tapering claw.

The caterpillar has acquired all the characteristic colouring and tubercles of the grown-up stage. It moves briskly using all the legs; develops in size rapidly and becomes dark, hairy and velvety.

The third instar larva.—The second moult occurs after 4 days from the first. The caterpillar is dark velvety on the sides with tubercles and hairs as in the previous instar. The length is about

7·0 mm. to 10·0 mm. and thickness 1·5 mm. to 2·0 mm. The scarlet tubercles on the sides of the head are prominent with groups of hairs. The middle red or scarlet streak extends till the tip of the abdomen. The velvety tubercles on the abdominal segments dorsally, and on the sides are prominent and look raised up. A number of scattered white dots or speckles are seen on all the tubercles. The caterpillar is very active, hangs by spinning long thread and gets scattered to adjacent parts of the plants with flower buds.

The fourth instar larva.—The third moult occurs after 3–4 days from the second. The caterpillar has grown up in size and all the characteristic colours, hairs and tubercles are as already noted. The size has increased—length 1·3 cm. to 1·7 cm. and thickness 3·0 mm. The scarlet tubercles with bunches of hairs, on either side of the head have become more prominent.

The fifth instar larva.—The fourth moult takes place after 3–4 days from the third. The increase in size is not much from the previous instar, the length being 1·8 cm. to 1·9 cm. and thickness 3·5 mm. to 4·0 mm. The caterpillar is quite grown up and has attained the maximum size. The scarlet tubercles with groups of hairs, on either side of the head, are quite characteristic and prominent.

Mode of pupation.—Pupation takes place after 4–5 days from the previous instar. The caterpillar pupates casting its skin either after fourth instar or fifth instar. Perhaps it depends upon the caterpillar attaining its maximum size and immediately after, casts its skin and pupates. Before pupation the caterpillar is inactive and has shed all the hairs and colouring has disappeared except for the yellow band on the abdominal portion. It is practically smooth, the scarlet tubercles on the sides of the head have also lost the hairs. A tough, thin, silken cocoon, greyish-white in colour, is formed, interwoven with the hairs of the body. The size of the cocoon depends upon the size of the caterpillar—the length being 1·6 cm. to 1·10 cm. and breadth 7·0 mm. The larval skin is cast and the caterpillar undergoes transformation inside the cocoon.

Pupa.—When the tough silken case is cut open, the pupa is brown in colour, pointed anteriorly. Length is 1·2 cm., and thickness 5·0 mm. Dorsally 8 segments can be made out on the abdominal region. Ventrally eyes are dark and visible; and 4 segments can be made out on the abdominal region. The last larval skin is moulted and pushed out, sticking at the posterior end of the pupa, in the cocoon.

When the moth emerges, the tough coccoon is torn and the pupal case is shrunken and crumpled inside the cocoon. The pupal period is 10–11 days.

Table I

Life-history of Euproctis scintillans *W., showing dates of different moults and period of different instars*

Sl. No.	Date of egg laying and incubation period	Date of hatching I instar	Date of I moult II instar	Date of II moult III instar	Date of III moult IV instar	Date of IV moult V instar	Date of pupation and pupal period	Date of emergence of moth and sex	Total period from date of egg laying to emergence of moth
									Days
1	2-1-47	7-1-47	11-1-47	14-1-47	17-1-47	21-1-47	25-1-47	3-2-47	33
	5 days	4 days	3 days	3 days	4 days	4 days	10 days	Female	
2	do	7-1-47	12-1-47	15-1-47	19-1-47	24-1-47	27-1-47	7-2-47	36
		5 days	3 days	4 days	5 days	3 days	11 days	male	
3	do	7-1-47	10-1-47	14-1-47	17-1-47	21-1-47	24-1-47	3-2-47	32
		3 days	4 days	3 days	3 days	4 days	10 days	Female	
4	do	7-1-47	11-1-47	15-1-47	19-1-47	22-1-47	27-1-47	6-2-47	35
		4 days	4 days	4 days	3 days	5 days	10 days	Female	
5	do	7-1-47	11-1-47	14-1-47	19-1-47	21-1-47	26-1-47	4-2-47	35
		4 days	4 days	5 days	3 days	5 days	9 days	Female	
6	do	7-1-47	11-1-47	14-1-47	19-1-47	..	24-1-47	4-2-47	34
		4 days	4 days	5 days	5 days		11 days	male	
7	do	7-1-47	10-1-47	14-1-47	17-1-47	21-1-47	25-1-47	4-2-47	34
		3 days	4 days	3 days	4 days	4 days	11 days	Female	
8	do	7-1-47	11-1-47	15-1-47	20-1-47		23-1-47	3-2-47	33
		4 days	4 days	5 days	4 days	..	11 days	male	
9	do	7-1-47	10-1-47	14-1-47	17-1-47	20-1-47	24-1-47	3-2-47	33
		3 days	4 days	3 days	4 days	4 days	10 days	Female	
Average	5 days	3-5 days	3-4 days	3-5 days	3-5 days	3-5 days	9-11 days	..	33-36

Adult moths

Female.—The female moth is medium sized, dirty brown in colour; head is yellow and tucked under and not easily visible. Proboscis is vestigial; palps are well developed. Eyes are large and prominent. Antennæ are pectinate or comb-like; but the palps and the antennæ cannot be easily made out.

The thorax is brown and hairy. The first pair of legs are not well developed; and all the three pairs are hairy. The third pair of legs has two paired spurs on the tibia; the middle pair possessing one pair of tibial spurs.

The abdomen is six-segmented, fully covered with yellow hairs extending to the sides. Dorsal side of the abdomen is dark; the anal tip has a tuft of yellow hairs, in the midst of which the anal opening is made out. The length of the moth from head end to anal tip is 1·0 cm. and thickness of the abdomen being 3·0–5·0 mm.

The fore-wings are arched; venation is strong. They are uniformly grey or brown and more hairy on the ventral side. The wings are irrorated with dark speckles. Three yellow patches are seen on the margin of each of the fore-wings—one at the apex, one in the middle and the other at the anal angle. Two small,

wavy slightly whitish-yellow bands are seen—one in the middle and the other posteriorly on the fore-wings. The lower wings are also grey in colour, hairy and venation is strong. Wing expanse from apex to apex horizontally is 2·5 cm. Scattered hairs are present at the junction of the wings, dorsally.

Male.—The male moth is smaller in size and description of the female moth holds good in the case of the male also, except for the absence of the yellow tuft at the anal end. There is only a small circlet of short hairs seen round the anus, which can be clearly made out. The ventral surface of the abdomen is slightly hairy. The length of the moth from head end to anal tip is 1·0 cm., and the wing expanse from apex to apex is 2·3 cm. The wavy lines are more prominent in the male than in the female.

Habits of the caterpillar

The young caterpillars, after they are batched, are gregarious but soon scatter in search of the flower buds. They hang down by spinning long threads and are blown off by wind to different branches and plants. They puncture the tender buds or the sepals of the flower and bore into it; feed upon the sepals and stamens of the bud or the opened flower. Even when tender leaves were provided, they were not preferred by the caterpillars. More than one flower is damaged by a single caterpillar.

Habits of the moths

They are inactive during the day; rest in the same place and are sluggish. They are active after dusk and are nocturnal in habit. Egg-laying takes place during the night, in about 24 hours after emergence. They were found to live for about a week.

I am grateful to Mr. B. Krishnamurti, Government Entomologist, for kind guidance in preparing this article. My thanks are also due to Mr. B. M. Maheswariah, Assistant Entomologist, for helping me with the material.

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Studies on Pith in Sugarcane

1. A New Method for the Quantitative Estimation of "Pith" in Sugarcane

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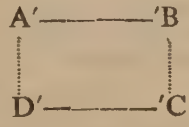
Introduction

It is a well-known fact that pith formation is an undesirable characteristic in sugarcane. The yield as well as the amount of juice obtained on milling is always lower in those varieties of sugarcane possessing this undesirable character.

Pith formation being a matter of great economic importance, particular attention is naturally paid by the sugarcane breeder to the pith-forming tendencies of the canes he evolves. For a study of the development of pith, the following technique is usually adopted. A stick of sugarcane is split longitudinally and an idea of the extent of pith formation is obtained by noting the white appearance of the parenchyma tissue and the spongy feeling when pressed with the finger. This "sight and touch" test is purely a qualitative one and cannot therefore be expected to give correct information regarding the relative susceptibilities of different varieties to pith formation. It was therefore felt desirable to find out means of measuring pith development in a more accurate manner and defining it in less qualitative terms. The experiments described in the following pages are preliminary attempts in this direction and forms the subject-matter of this communication.

Principle of the Method

When a certain variety of cane has turned pithy, it will be found that the sap vessels are partly filled with juice and partly by air. If the cells are completely filled with juice, no pith formation is understood to have taken place. The present method of measurement of pith formation is based on this phenomenon, and may be briefly indicated as follows: Let ABCD represent a portion of sugarcane and let V c.c. be its volume. This volume may be supposed to be made up of a certain volume occupied by juice and the rest of space occupied by fibre. Let J c.c. be the volume of juice present in V cc. of cane. F gm. be the weight of fibre and D its density.



If there is no pith development in ABCD, then $V = J + \frac{F}{D}$ (1) Whereas if pith has developed in ABCD, then the volume unoccupied by juice is $V - \left(J + \frac{F}{D}\right)$ c.c. (2) namely the space occupied by air.

This equation may therefore be taken to represent the amount of pith present in V c.c. of cane. For comparative purposes, it would be convenient to express it on a percentage basis. Then the percentage of pith is $\frac{V - J - F/D \times 100}{V}$ (3). The methods for determining the several factors in equation (3) are described below.

Materials and Methods

Sampling.—15 to 21 canes (in multiples of three) are selected at random from the varietal plots. The canes are then topped and cleaned. Each cane is cut into three equal parts and the three bits are placed on the ground in a line one above the other in their natural order to form an entire cane. The rest of the canes are treated in the same manner and arranged parallelly. Then always beginning from one end, the bottom portions of 1, 4, 7, 10 ....19th canes are picked up, tied into a bundle and labelled. The middle portions of 2, 5, 8....20th canes are picked up as before, bundled and labelled. Similarly the top portions of 3, 6, 9,....21st cane are also treated in the same manner. The unpicked portions are then rejected.

Determination of volume and weight of portions of cane

The volume and weight of the different portions of sugarcane is determined with the help of an apparatus shown in Fig. 1. "A" is a tall cylinder made of galvanized iron the height being 120 cm. and diameter about 12 cm. About 12 cm. from the open top a circular hole is made in the cylinder, provided with a flange for the insertion of one-holed rubber stopper. Two glass tubes (internal diameter 6 mm.) bent at right angles are inserted in the stopper as shown in Fig. 1. The cylinder is placed on level ground and clean water is filled to the top. When the water stops issuing from the syphon, one piece of cane is weighed in a balance capable of weighing up to about 3 kilos correct to one gram in weight. By means of a piece of strong thread tied to one end of the cane, it is immersed completely in water and the displaced water issuing out of the syphon is caught in a weighed receptacle and weighed. In this way all the canes in the bottom, middle and top portions are treated. The weight of water will directly give the volume of cane. Specific gravity may also be determined by the following equation as the weight of cane and the weight of displaced water are known.

$$\text{Sp. Gr.} = \frac{\text{Weight of cane}}{\text{Weight of displaced water}}.$$

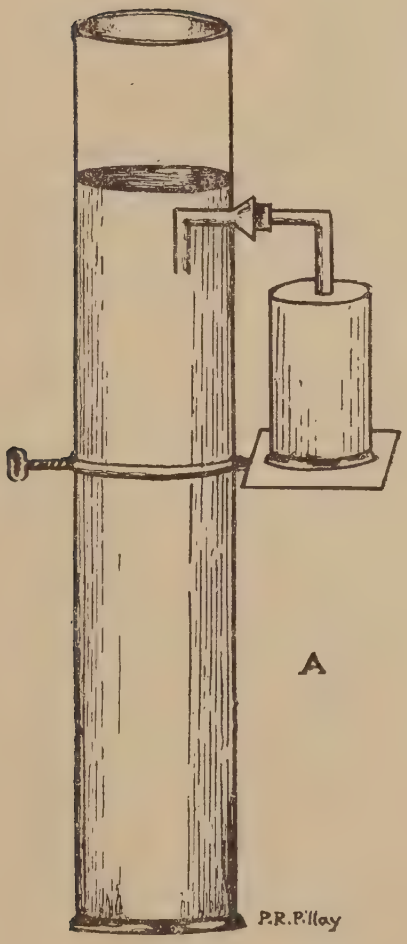


FIG. 1

Determination of the percentages of extraction of juice by weight and by volume

After the determination of specific gravity, the bottom, middle and top portions are separately milled in a bullock-driven iron mill. The weight and volume of the juices thus obtained are recorded. Extraction percentage by weight and by volume is now calculated as shown below:

$$\text{Percentage extraction by weight} = \frac{\text{Weight of juice}}{\text{Weight of cane}} \times 100$$

$$\text{,, ,, by volume} = \frac{\text{Volume of juice}}{\text{Volume of cane}} \times 100$$

The bagasse corresponding to different portions of cane is carefully collected in a bag made of drill cloth and dried in the sun if there is bright sunlight and then in the steam oven. Otherwise it is cut into small bits, an aliquot portion taken and dry matter estimated in a steam drying oven. Brix reading of the several juices corresponding to the three different portions of cane is also noted.

Determination of specific gravity of fibre in bagasse

After the estimation of dry matter in bagasse, a small quantity (about 50 gm.) is reduced to the same state of fine condition in a mill as is done in the case of grasses and hay prepared for chemical analysis. By means of a pair of scissors, the longer bits are cut into smaller lengths of about a quarter of an inch. About 8 to 10 gm. of this powdery material are placed in the filter-paper fitted to a funnel and washed with hot distilled water and then washed with cold water until free from sucrose (test with α-Naphthol reagent). The wet material is then spread on a clock glass and dried in the steam-oven to constant weight. The dried material is then preserved in glass stoppered bottles.

To three, 100 c.c. beakers (tall form) 3 to 4 gm. of material of bottom, middle and top portion are weighed out. A small quantity of distilled water (about 35 c.c.) is added to each and boiled over a low flame for about ten minutes. After cooling to about 40° C., the contents are transferred to 100 c.c. weighed measuring flask. The flasks are then plugged with wire-gauze plugs attached to stout aluminium wire for easy insertion and removal. These plugs keep back the solid material if the liquid in the flask tries to boil over vacuum. The flasks are then cooled to about 40° C., wiped dry, and placed inside a vacuum desiccator and air exhausted. They are allowed to remain under high vacuum for about two hours, then removed, and cooled in a cold water-bath to room temperature. The wire-gauze plugs are then removed and adhering particles are returned to the flasks. Cold water is then added to the flasks and accurately adjusted to the mark by means of a reading lens if necessary. Drops of water adhering to the sides of the stem above the water-level should be removed

by means of filter-paper wrapped round a glass rod. The flasks are then accurately weighed and the temperature of water in the flasks is noted. The contents of the flasks are then poured out and cleaned. Distilled water is then filled into the flasks to the same mark as before and again wighed. From the data collected the specific gravity of cane fibre may be calculated from the following equation:—

$$\text{Specific gravity} = \frac{Wd}{W_2 + W - W_1},$$

Where W gm. = weight of dry substance.

d = density of water at ° C.

W_2 = weight of water completely filling the flask

W_1 = + water + substance.

Discussion of Methods of Analysis

For determining the volume " V " of the bottom, middle and top portions of canes, they have to be immersed in water. The one objection that can be raised to this procedure is that the cane might lose some total solids especially from the cut ends while immersed in water. In the short interval of about two minutes during which it is in contact with water, it is very unlikely that appreciable quantities of total solids get dissolved in water. Immersing the cut ends in molten paraffin suggested itself, when this treatment was tried, very little difference was observed.

Specific gravity of fibre in cane

It has been described previously that in order to determine the specific gravity of fibre in cane, the fibre has to be boiled in water to expel the enclosed air. Shorey as quoted by Princen Geerligs found that cane fibre from which all the constituents of juice had been withdrawn by extraction with cold water yielded a soluble substance to boiling water and the more so the longer the treatment with hot water is continued. After examining this question in detail, Geerligs concludes that boiling for a period of ten minutes does not cause any appreciable quantity of the fibre to pass over into the liquid. This question was examined by the present writer and it was found that on an average 4 grammes of fibre loses about 0·0275 gm. or 0·59 per cent. by boiling in hot water.

The suitability of employing other liquids in the place of water is under investigation.

The several processes involved in calculating the percentage pith in the cane are shown below by means of one example.

Variety. POJ 2878—Bottom

Weight of cane	2259 gms.
Juice	1260 gms.
Wet bagasse	999 gms.
Dry matter in bagasse	409 gms.
Weight of water in bagasse	590 gms.
*Total solids corresponding to 590 gms. of water are	130·7 gms.
Weights of juice in wet begasse	590 + 130·7=720·7 gms.
So the total weight of juice in cane	1260 + 721 or 1981 gms.
*Volume of juice corresponding to 1260 gms. is	1184 c.c.
*Volume occupied by the total juice	$\frac{1184}{1260} \times \frac{1981}{1} = 1862$ c.c.
Dry matter in bagasse	409 gms.
Total solids in dry matter	130·7 gms.
Weight of pure dry fibre	278·3 gms.
Specific gravity of pure fibre	1·4692
Volume occupied by pure fibre	$\frac{278 \cdot 3}{1 \cdot 4692} = 189 \cdot 4$ c.c.
Total volume occupied by juice + fibre	= 1862 + 189 = 2051
Volume of cane	= 2087 c.c.
Volume of juice + fibre	2051 c.c.
Volume not occupied by juice	= 36 c.c.
Hence percentage pith	$\frac{36}{2087} \times 100 = 1 \cdot 73\%$

Discussion of results in Table II, data regarding specific gravity, extraction by weight and volume, percentage of pith in cane and Brix of juice are given, percentages of pith developed are given for the whole cane, bottom, middle and top portions. In interpreting the values given for percentages of pith, a certain allowance has to be made for air-space usually present in normal canes, namely in cases in which there is no pith formation. These figures may be found by finding the average of figures given for pith in different portions of normal canes. The figures to be allowed are found to be about 3.0 per cent. for whole cane 3·5 per cent. for bottom and 3·0 per cent. for middle and top. Excess above these figures may be taken as due to pith formation.

Examining now the development of pith determined as previously described, it will be seen from Table II that many varieties are free from pith in any portion of their length, while others exhibit it to a large extent. HM 320, CO. 419, POJ 2878, Red mauritius, HM 608 and CO. 360 all planted in July and some of the I.C. varieties evolved by the Sugarcane Research Officer, like IC 36, IC 104, IC 136, IC 137 are free from pith development, whereas HM 320, CO. 419, POJ 2878 November to February

planted, show pith in them to a greater or less extent. Some of the IC varieties also show the development of pith in some portion of their stalk to a great extent. Generally the bottom portion is not so much affected as the middle and top portions.

Effect of Season on the Development of Pith

As shown in Table II eighteen varieties have been analysed of which six varieties have been planted both in summer and winter months. In Mysore, the sugarcane planting season begins usually in the month of January and ends by the first week of April. This planting is known as winter planting. The crop of this planting ripens in less than twelve months. Cane planting is also done in the months of June, July and August on a restricted scale under big tanks and canal-fed areas. This planting is known as monsoon or summer planting. The crop begins to ripen from September onwards of the following year. The effect of the above two seasons of planting and of the variety can be studied in Table II on the pith-forming tendency.

Most of the varieties planted in July do not show tendencies to pith formation. For example, the whole canes of HM 320, CO. 419, POJ 2878, IC 36, HM 608, Red Mauritius, IC 105, IC 104, IC 136, IC 137, CO. 360 show percentages of pith between 0·6 to 3·5 excepting IC 105 and CO. 360 which show a little more than 3·5 per cent. This shows that the above varieties planted in July show very little tendency to pith development. Of the eleven varieties mentioned above four varieties, *viz.*, HM 320, CO. 419, POJ 2878 and IC 36 have been planted also in the winter season, the first two varieties in February and the last two in November. The percentage of pith in whole cane are 5·25 and 19.9 for HM 320 and CO. 419 and 5·72 and 7·4 for POJ 2878 and IC 36 respectively. The percentage of pith for the top portion are 9·2 and 43·5 for HM 320 and CO. 419 and 13·71 and 15·43 for POJ 2878 and IC 36 respectively. These figures, being more than 3·0 per cent., which is the limit allowed for inter-cellular air-space, indicate that a large amount of pith depending on the variety has developed in them. Thus it may be seen that the above four varieties show tendencies to pith formation when planted in winter in contrast to summer planting, and that comparatively HM 320 has the lowest amount of pith and CO. 419 the largest amount. Comparing the planting of two seasons it may be said that CO. 419 is best suited for summer planting whereas HM 320 can be tried for both seasons. POJ 2878 and IC 36 do well as July plantings but may not be very suitable for being planted in winter.

Some varieties behave in a peculiar manner. IC 29 as July planting has the largest amount of pith developed in the middle rather in the top, namely 12·72 per cent. against 4·55 in the top. IC 11 as July planting shows in whole cane 10·9 per cent. of pith,

TABLE II

Pith formation studies in some varieties of sugarcane

Sl. No.	Variety and portion of cane analysed	Date of planting	Sp. Gr.	Extraction		Per cent. Pith formation	Brix of juice at 17°·5 C.
				by weight	by volume		
1	H.M. 320						
	Whole cane	Feb. 1939	1·0728	65·2	64·4	5·25	20·07
	Bottom		1·0759	65·4	65·9	3·54	20·07
	Middle		1·0787	65·2	65·7	3·54	20·87
	Top		1·0623	65·05	61·02	9·20	19·19
2	H.M. 320						
	Whole cane	July 1939	1·0995	55·69	55·83	3·42	22·80
	Bottom		1·1099	57·05	57·47	5·19	22·79
	Middle		1·0907	58·77	58·45	2·99	23·52
	Top		1·0952	49·55	49·58	2·89	21·72
3	CO. 419						
	Whole cane	Feb. 1939	0·9553	71·2	58·60	19·90	15·45
	Bottom		1·0689	73·6	69·19	3·22	16·78
	Middle		1·0077	72·3	63·50	14·16	15·18
	Top		0·7284	44·3	37·30	43·47	12·75
4	CO. 419						
	Whole cane	July 1939	1·0920	54·6	54·9	2·38	20·09
	Bottom		1·1019	56·64	57·4	2·16	20·29
	Middle		1·0914	52·05	52·72	1·87	20·89
	Top		1·0835	54·30	54·2	2·88	19·49
5	POJ 2878						
	Whole cane	July 1939	1·0916	51·67	51·11	2·59	22·23
	Bottom		1·0917	56·05	55·68	3·41	22·35
	Middle		1·0912	50·77	51·33	2·31	23·15
	Top		1·0921	46·31	46·74	1·70	20·35
6	POJ 2878						
	Whole cane	Nov. 1939	1·0314	50·81	49·59	5·72	17·69
	Bottom		1·0783	55·78	56·73	1·77	18·14
	Middle		1·0729	52·97	53·35	2·77	18·44
	Top		0·9283	41·37	37·06	13·71	15·53
7	IC 29						
	Whole cane	July 1939	1·0193	60·52	58·14	7·87	16·73
	Bottom		1·0486	61·02	59·91	6·54	17·38
	Middle		1·0	63·60	58·10	12·72	16·70
	Top		1·0098	57·05	56·40	4·15	15·20
8	IC 29						
	Whole cane	Nov. 1939	1·0114	50·82	45·95	9·43	16·05
	Bottom		1·0611	50·67	50·64	5·98	16·83
	Middle		1·0149	53·33	44·27	9·67	15·73
	Top		0·9578	47·65	43·43	13·18	15·63
9	IC 36						
	Whole cane	July 1939	1·0819	56·80	57·47	1·98	18·86
	Bottom		1·0933	56·02	57·28	1·45	20·28
	Middle		1·0829	58·04	58·70	1·40	19·18
	Top		1·0657	56·25	56·04	3·55	16·26

TABLE II—(*Contd.*)

Sl. No.	Variety and portion of cane analysed	Date of planting	Sp. Gr.	Extraction		Per cent. Pith formation	Brix of juice at 17°.5 C.
				by weight	by volume		
10	IC 36						
	Whole cane	Nov. 1939	1·0220	49·32	47·68	7·40	16·52
	Bottom		1·0765	52·47	53·06	3·28	17·63
	Middle		1·0432	50·61	49·98	5·32	15·83
	Top		0·9230	42·59	37·66	15·43	15·43
11	IC 11						
	Whole cane	July 1939	1·0265	51·98	48·48	10·93	19·32
	Bottom		1·0543	49·14	46·93	9·22	19·57
	Middle		0·9822	53·16	47·63	14·70	19·17
	Top		1·3226	54·40	51·00	9·67	19·19
12	IC 11						
	Whole cane	Nov. 1939	1·0519	45·69	45·52	4·81	18·25
	Bottom		1·0964	48·69	50·73	1·82	19·14
	Middle		1·0914	47·62	48·41	1·99	19·04
	Top		0·9479	38·46	35·15	11·99	15·24
13	HM 608						
	Whole cane	May 1939	1·0916	64·40	65·03	2·63	21·28
	Bottom		1·0915	66·70	67·26	4·94	21·38
	Middle		1·0909	64·23	64·94	2·26	21·38
	Top		1·0924	60·73	61·56	1·79	20·98
14	Red Mauritius						
	Whole cane	May 1939	1·0874	62·94	64·40	0·69	18·75
	Bottom		1·0948	64·71	66·78	0·18	19·15
	Middle		1·0913	63·41	64·70	1·30	19·98
	Top		1·0721	59·80	60·70	nil	16·56
15	IC 74						
	Whole cane	July 1939	0·9463	56·23	50·08	14·56	15·92
	Bottom		1·0290	58·36	55·47	8·66	18·32
	Middle		0·8889	55·40	46·62	19·80	16·70
	Top		0·9192	54·54	48·01	15·30	12·18
16	IC 105						
	Whole cane	July 1939	1·0652	56·49	56·55	4·55	18·40
	Bottom		1·0773	57·50	57·31	3·72	19·48
	Middle		1·0696	56·80	58·30	4·96	19·38
	Top		1·0455	54·84	53·58	5·09	15·76
17	IC 104						
	Whole cane	July 1939	1·0875	57·19	57·67	3·07	18·69
	Bottom		1·0930	55·91	56·93	2·96	18·78
	Middle		1·0837	58·04	57·82	4·04	19·48
	Top		1·0856	57·67	58·32	2·01	17·63
18	IC 136						
	Whole cane	July 1939	1·1007	55·23	55·69	2·52	21·13
	Bottom		1·1103	56·04	57·24	2·37	21·68
	Middle		1·1016	55·96	56·49	2·08	22·08
	Top		1·0898	53·20	53·21	3·18	19·38
19	IC 137						
	Whole cane	July 1939	1·1194	50·0	52·6	0·82	20·90
	Bottom		1·1263	50·0	54·23	..	21·08
	Middle		1·1201	50·0	52·92	..	21·58
	Top		1·1108	49·8	51·68	2·74	19·88

TABLE II—(*Contd.*)

Sl. No.	Variety and portion of cane analysed	Date of planting	Sp. Gr.	Extraction		Per cent. with formation	Brix of juice at 17°·5 C.
				by weight	by volume		
	IC 15						
20	Whole cane	July 1939	0·9968	51·64	46·38	14·40	19·04
	Bottom		1·0557	53·46	51·26	8·67	18·77
	Middle		0·9827	52·93	46·45	16·37	19·07
	Top		0·9267	46·78	39·01	20·42	19·55
	HM 681						
21	Whole cane	July 1939	0·9430	32·60	28·30	18·74	20·40
	Bottom		1·0660	34·88	33·80	8·53	21·05
	Middle		0·8683	29·80	24·0	25·55	19·92
	Top		0·8612	31·73	24·50	24·89	19·72
	IC 21						
22	Whole cane	July 1939	1·0309	49·7	46·5	11·39	20·75
	Bottom		1·0862	50·61	49·97	5·62	20·95
	Middle		0·9549	50·27	45·70	13·48	21·15
	Top		0·9876	47·40	42·70	17·30	20·05
23	IC 76						
	Whole cane	July 1939	0·9975	47·6	43·80	12·59	20·08
	Bottom		1·0554	47·45	46·40	7·04	21·62
	Middle		0·9564	47·20	41·30	16·98	20·72
	Top		0·9638	48·50	43·50	12·59	17·92
24	CO. 360						
	Whole cane	July 1939	1·0681	54·36	55·61	4·98	19·71
	Bottom		1·0636	54·55	53·63	5·65	19·55
	Middle		1·0650	55·94	55·70	4·75	19·85
	Top		1·0765	52·42	57·64	4·50	19·72
25	CO. 419	July 1939					
	Whole cane	All canes in	1·0787	56·13	55·32	4·71	21·09
	Bottom	samples had	1·0890	60·0	59·32	4·62	21·11
	Middle	flowered	1·0787	54·48	54·07	3·98	21·31
	Top		1·0618	51·22	49·98	5·59	20·81

whereas as November planting shows only 4·8 per cent. which is rather peculiar. Like IC 29 this variety also has the largest amount of pith in the middle portion.

Some varieties show that more than two-thirds of the millable portions of their stalk is affected by pith. These varieties are CO. 419 February planting, IC 29 November planting, IC 11 July planting, IC 74, IC 15, HM 681, IC 21 and IC 76.

It is generally believed that flowering of sugarcane is the cause of pithiness. To test this assumption, a sample was collected in which every stalk had flowered, from a plot which had been planted in July and the sample was analysed. The analytical data (serial No. 25 in Table II) shows that the bottom, middle and top portions are free from pith. This data seems to point to the conclusion that the season of planting not flowering, is the factor responsible

for pithiness in cane. More data will be collected to pass a final opinion in the matter.

The relationship that exists between pith and other characteristics of sugarcane may now be examined. With regard to the data between specific gravity and percentage of pith, there is a well-marked relation. For example, in the case of CO. 419, the specific gravity of the top portion is 1·0835 where there is no pith development in that portion. But where the cane has developed 40% of pith, the specific gravity falls down to 0.7284. The same relationship may be seen to be existing in the case of other varieties. On calculating the coefficient of correlation between specific gravity and pith percentages, a value $r = 0 \cdot 9414$ was obtained. This shows that these two factors are very strongly correlated negatively, namely as the pith goes on increasing, the specific gravity goes on decreasing; for routine purposes where a knowledge of exact percentages of pith are not required, specific gravity of the cane may be determined which gives a better idea of the development of pith than the 'sight and touch' test.

The percentage of extraction bears a direct relationship to pith formation. The percentage of extraction both by weight and volume has been determined. In case in which pith has not developed, extractions by weight and volume are more or less the same as shown for example in Sl. Nos. 2, 4, 5, 9, 13, 14, 17, 18 and 25; where pith has developed in cane, appreciable difference between the extractions by weight and volume can be seen. For example, in the case of CO. 414, Sl. No. 3 with 20 per cent. pith, the difference between the two extractions is 12·6 per cent. Similarly in the serial No. 6 top, serial No. 7 middle, Sl. No. 8, Sl. No. 10, top Sl. No. 11, Sl. No. 15, Sl. No. 20, 21 and 23 the two extractions differ from each other due to development of pith. This difference can be explained as follows: The formulæ for extraction by weight is

$$\frac{\text{Weight of juice}}{\text{Weight of cane}} \times \frac{100}{1}$$

$$\text{Extraction by volume} = \frac{\text{Volume of juice extracted}}{\text{Volume of cane}} \times \frac{100}{1}.$$

Due to pith formation, a certain quantity of juice disappears from cane. In the first equation this loss of juice is not reflected as some weight disappears both from the numerator and denominator tending to keep the ratio more or less constant. But in the second equation the case is different. Here the volume of cane does not alter whether pith has developed or not. If juice disappears due to pith formation, the volume of juice decreases with the result that the extraction by volume is a lower figure. Pith development is better indicated by the percentages of extraction by volume.

That the development of pith gives a lower quantity of juice on milling the cane in the ordinary way is shown by comparing the extraction figures for POJ 2878 and IC 36. Comparing serial numbers 5 and 6 it will be seen that the development of pith has resulted in a loss of 1·52 per cent. by volume of juice for the whole cane and 9·68 per cent by volume for the top portion. Similarly in the case of IC 36 where the development of pith is much more than in the case of POJ 2878, the loss of juice due to pith is 9·79 per cent. for the whole cane and 18·38 per cent. for the top portion.

Summary

1. A new method for the quantitative estimation of pith in sugarcane has been described.

2. The effect of season on the development of pith in sugarcane has also been shown. Some varieties planted in summer season show little tendency to form pith, whereas the same varieties planted in winter months develop pith in some portions of their stalk.

3. It has been shown that flowering in sugarcane has no effect on the development of pith in cane.

4. It has been shown that specific gravity of cane is closely correlated to pith in sugarcane.

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SELECTIONS

Compost Manure

The following is from Gandhiji's pen in the *Harijan* of December 28, 1947:—

"An All-India Compost Conference was held in New Delhi during the month to consider the question of compost development on the widest scale possible. It was the conception of Shrimati Mirabehn and was presided over by Dr. Rajendra Prasad. Sardar Datar Singh, Dr. Acharya and other eminent men in the line took part in it. Several important resolutions were passed by it on schemes for towns and villages. A Sub-Committee consisting of Shrimati Mirabehn, Shri Shivakumar Sharma, Dr. B. N. Lal and Dr. K. G. Joshi (with Dr. B. N. Lal as Convener) was appointed to prepare a skeleton scheme for the provinces. The resolutions emphasized the necessity of 'The agricultural utilization of town sewage, sullage and sludge, the utilization of the by-products of the slaughter house and other trade wastes (for example, wool waste, mill waste, leather-waste, etc.) and for the composting of other materials like water-hyacinth, cane-trash, press mud, forest leaves, etc.'

These resolutions are good and useful if they do not remain merely on paper. The chief thing is whether they would be reduced to practice throughout India. To do so will tax the resources of many Mirabehns. Given the willing co-operation of the masses of India, this country can not only drive out shortage of food, but can provide India with more than enough. This organic manure ever enriches, never impoverishes the soil. The daily waste, judiciously composted, returns to the soil in the form of golden manure causing a saving of millions of rupees and increasing manifold, the total yield of grains and pulses. In addition, the judicious use of waste keeps the surroundings clean. And cleanliness is not only next to godliness, it promotes health."

Compost has also figured in more than one of Gandhiji's post-prayer speeches, with reference to which the following report is also interesting:—

"Gandhiji had talked to them about compost manure the previous evening. The excreta of animals and human beings mixed with refuse could be turned into golden manure, itself a valuable commodity. It increased the productivity of the soil which received it. Preparation of this manure was itself a village industry. But this, like all village industries, could not give tangible results unless the crores of India co-operated in reviving them and thus making India prosperous. This was the fundamental distinction between capital and labour. Capital exploited the labour of a few to multiply itself. The sum total of the labour of the crores, wisely utilized, automatically increased the wealth of the crores. Therein lay true democracy, true Panchayat Raj."

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